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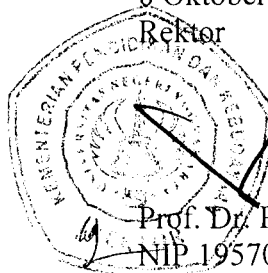
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14

Vocational Education as a Scientific Discipline
(Best Practice in Academic Study Program Vocational Education
at Yogyakarta State University - YSU)

Abstract

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The development of vocational education is growing more complex and fast according to the technology needs in the work field. The institution of teacher vocational education and training that prepares candidates for teacher in vocational secondary school has duty to support student's experience learning in vocational skills and teaching skills. Both of those skills need specific strategy for instructional that is different from instructional in preparing general teacher for general secondary school. The differences become more obvious when associated to the case of development technology and occupation in the work field. For that reason the enhancement role of vocational education scientific as self-academic discipline in the implementation vocational education needs to be taken into consideration.

Based on Tanyaburi Statement, about "research on TVET have to be strengthened and/or established as a self-reliant scientific field and academic discipline", therefore this article will discuss best practices of vocational instructional in workshop and research in vocational education that have done in Yogyakarta State University, Indonesia. Yogyakarta State University has academic study programs to prepare vocational teachers in secondary school. However, the university finds some difficulties in how to deliver vocational education as academic scientific discipline which is supposed to be self-dependence instead of in the education and natural science domain.

INTRODUCTION

The development of vocational education is growing more complex and fast according to the technology needs in the work field. The institution of teacher vocational education and training that prepares candidates for teacher in vocational secondary school has duty to support student's experience learning in vocational skills and teaching skills.

Vocational teachers are required to occupy both pedagogy and vocational skills. Those two skills are dependent and both of those skills need specific strategy for instructional that is different from instructional in preparing

general teacher for general secondary school. The differences become more obvious when associated to the case of development technology and occupation in the workfield.

Teachers and lecturers role in the vocational education is significant. The recruitment for vocational education will be therefore very effective when teachers have vocational qualification. Nevertheless, most of teachers and lecturers in the vocational education are non vocational education background. Instead, they graduated from general education which lacks of vocational skills. This phenomenon implies the lack understanding on vocational education concept as a science that differs from education and engineering science.

In regards to the "Tanyaburri Statement" (2013), about Vocational Teacher Education (VET) is a study programme provided by universities, its role is to enhance and/or establish VTE as a self-reliant scientific field and academic discipline. Based on that statement we try to realize in our institution depends on our experiences to manage vocational education as a study program. This paper investigates the vocational education as a self-reliant scientific discipline in terms of learning and research in the Faculty of Engineering Yogyakarta State University (YSU).

VOCATIONAL EDUCATION SYSTEM IN INDONESIA

Vocational education system in Indonesia is described in the National Qualification Framework model, which has two tracks of education: academy and professional. Vocational education is considered as the professional part, that conducts 1-year, 2-year, 3-year, and 4-year diploma education, which therefore continues to applied master and doctorate program. As for the lower level, professional education applies vocational senior high school which can be obtained for 3-4 years.

Students' learning experience in vocational senior high school and in the higher education is greatly influenced by the teaching skills factor. John Hattie (2003) argues that the success of learning is affected by 30% of teachers' factor, 50% of students' factor, and the rest of 20% includes school principal, peer, school, and home. This implies that apart from students readiness, teachers play important role for affecting good learning

environment. Both teachers' vocational and pedagogy skills are therefore considered as the challenge in the vocational education.

In case of study programs in the university, they refer to a major study or department such as in education, mechanical, electronic, mining, agriculture, business, nursing, communication, and many more. Program study will lead the student to personal career goals and objectives in the field work that they prefer. Faculty of Engineering YSU (FE YSU) facilitates vocational education for bachelor and diploma. Bachelor graduates are expected to work as vocational senior high school teachers, while the diploma graduates are to work in the mid level in the industry. The program study would be chosen by student when apply as a new student in the first semester. FE YSU as an institution that prepares vocational education teacher has eight program studies; 1) Electrical education technology, 2) Mechatronic education technology, 3) Electronic education technology, 4) ICT education technology, 5) Mechanical education technology, 6) Otomotive education technology, 7) Civil education technology, 8) Food education technology,9) Fashion education technology.

In the faculty, the learning environment emphasizes on the skill development, which is supported by theoretical and practice learning in the classroom, workshop, and laboratory. Hands-on skill philosophy is widely implemented either in the workshop or laboratory, which supports teachers readiness to facilitate students centered learning. The competency assessment of students' learning experience highlights the process or performance assessment, while product assessment is part of the whole evaluation. In the other side, the instructional strategy which points out on how those skills can achieved rather than only assessing the product output itself is one the vocational education characteristics. This concept has been implemented in all subject especially in the laboratory and workshop.

SCIENTIFIC DEVELOPMENT IN VOCATIONAL EDUCATION

The scientific development in each field is adjusted to the scientific need application itself. Research and applied science in the work field can be used as a base of vocational education development consideration as a self-reliant discipline.

In the late 30 years, scientific research shows cognitive science rise in varied human cognition researches. Education is an aspect of human cognition that its effect can be observed, especially in terms of attitude changes as a consequence of learning process treatment (Shamir Okasha, 2002). In the domain of pedagogy, the application can bring the change on architecture of human mind in general. The broad capability on problem solving is considered as part of human mind. However this capability is part of limited capability specialization or module that suits to solve certain problem instead of whole problem. In general, this circumstance shows that the effect of learning model in general school is somehow cannot be applied for solving the problems that faced by graduates from vocational school. Therefore, specific learning model is needed to suit vocational education and learning objectives.

Vocational pedagogy is a term to describe a specific learning scope in the vocational education. Vocational pedagogy is a science, art and craft of teaching that prepares people for certain kinds of works (Lucas, Spencer, and Claxton, 2012). That concept is deferent to general education, which has goal to prepare people to get higher education.

Eventhough vocational pedagogy illustrates the derivation of general education principles, nevertheless vocational pedagogy deals with some big challenges. Firstly, vocational pedagogy lies on two domains including education and workplace. Secondly, that condition requires two skills consisting an expert teacher who has experience in the work field, and also as the worker who master the vocational skill learning and education.

Furthermore, the application needs a sufficient equipment to support vocational skills mastership based on the expertise.

DISCUSSION

A. Learning/Instructional Perspective

Vocational instructional design illustrates the system that can be learned and applied in order to prepare either in whole vocational learning or in each learning subject. Instructional design model Dick & Carey shows a variety of design component that must be fulfilled. One of them that relates to learning process is a Instructional Strategy. Dick & Carey (1996:347) argue

that instructional strategy comprises whole plans and activities to achieve learning objectives, including intermediate objective and activities accomplishment.

Vocational education prioritizes the learning process or part of it which relates to intermediate objective achievement. That condition points out the characteristic of vocational education that employs stage and verification on students learning mastering in each part of learning accomplishment.

The ICT development that utilizes computer as one of learning media greatly supports practice learning in either physical or intellectual skills. Seeland Richey (1994) imply that computer based technology is ways to produce and deliver material using microprocessor-based equipment. More importantly, the computer-aided simulator equipment is very beneficial to support physical skill training that concerns on safety and healthy risks as well as expensive equipments that being used i.e. CNC mechanical learning, underwater welding, mining explotion, flight pilot training, risky chemical processing. The simulator equipment usage in the learning is one of simulation learning method concept implementation.

Simulation learning method is one of learning strategy. Atwi Suparman (2005) argues that the learning strategy consists of three aspects, namely (1) learning stage, (2) learning method, (3) learning media, and (4) learning period. That four aspects combination is coped in one simulation method learning strategy in order to simplify the name. Further, to differentiate with other strategies, it is identified as simulation learning strategy (Bruri Triyono, 2006). Gokhale (2004) implies that computer-aided simulation learning strategy offers some benefits, which are (1) the real characteristics of what is being learned can be displayed clearly, (2) treatment and buying costs, as well as renewal on laboratory equipments are more expensive than hardware and software computer cost, (3) physical safety will be more secure in the simulation learning.

Based on some concepts above, it reveals that simulation learning strategy in the vocational education has some typical characteristics that differentiates the simulation concept in the general education. Some different advantages in regards to students' learning experience attainment are as follows:

- In the vocational education, simulation that employs similar equipments and materials as the original, apply similar process and activities as in the work field, and produce unreal output (goods) that can be displayed on the computer monitor in 3-D will be very beneficial to enhance students learning process. In the same time, the concerns of using expensive equipments and risky can also be eliminated. Additionally, the amount of practice jobsheet can be more accomplished rather than using the original real equipment in the same learning hours.
- In the general education, the simulation uses duplicate equipments which its form and material is different from the original will create a pretending activities therefore unsuitable for the work place application. The other shortcoming is that the unreal or even unavailable product creation makes the students difficult to achieve the learning objectives.

B. Vocational Education Research Perspective

Based on the vocational context either in the work field or education as well as information technology development or technology in the work field, research in vocational education has important role to solve the problems of those two areas. Several fields related to vocational education can be applied to learning and product development as the output of technology application itself. The next discussion will illustrate the master plan of development in YSU research roadmap and the attempt of Faculty of Engineering to re-arrange vocational education as a self-science discipline which covers six aspects; Quality Assurance System, Evaluation, Instructional, Curriculum, Management, and Applied Technology.

Before rearrangement, reserach roadmap in YSU has only four scientific field (Master Plan of Development YSU, 2012), while vocational education is a small part of education scientific field. The research related to technology is under mathematic, natural science and technology domain. Figure 1 shows the YSU research roadmap – fishbone YSU Master Plan of Development.

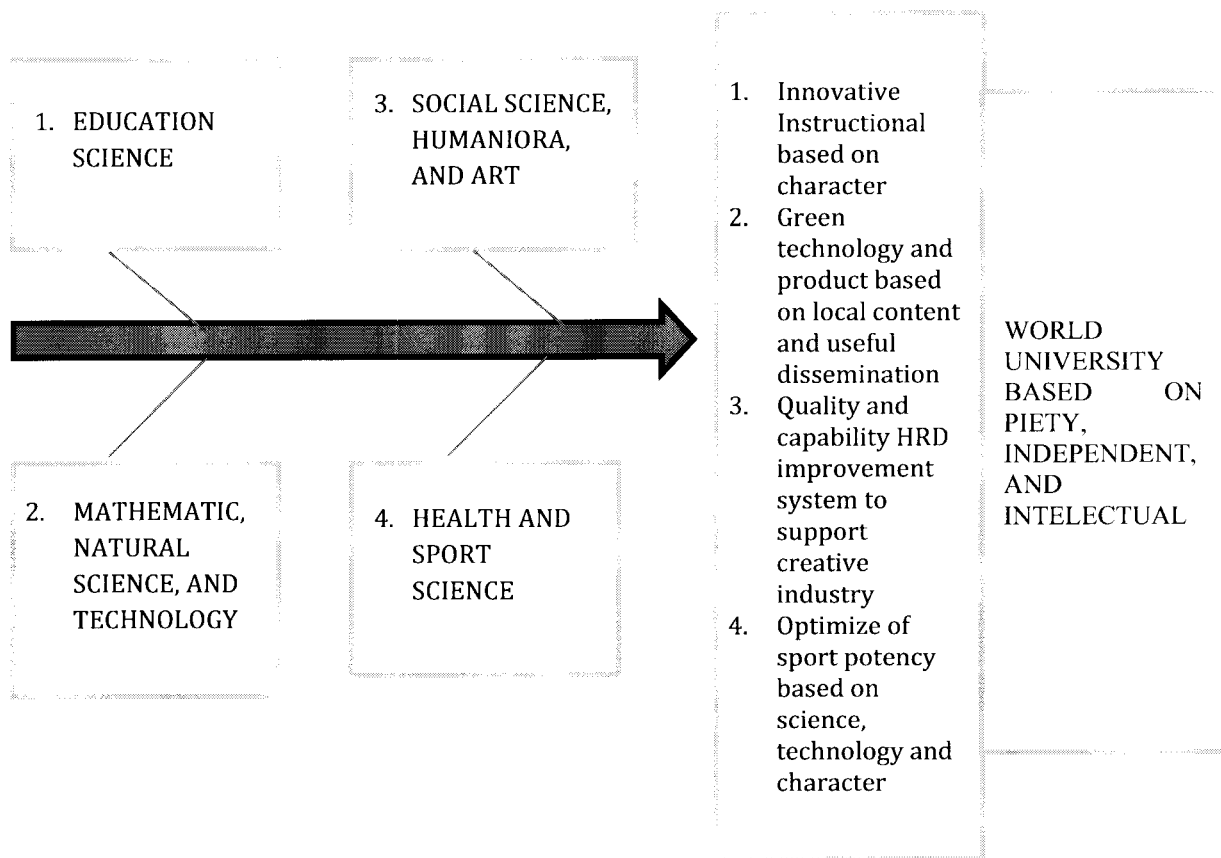


Figure 1: YSU Research Roadmap (Fishbone YSU Master Plan of Development, 2012)

The main goal of the fishbone YSU master plan of development is World University based on piety, independent, and intellectual. To reach the main goal we have four interim goals that describe in the box before main goal box in Figure 1 and that goals are adapted to the characteristic of each scientific field. The implementation guidance in the research field is defined by the themes that grouping in the development of strategic issue. The implementation of strategic issue research in vocational education is linking to all interim goals and focus to the Innovative Instructional based on character, and the quality and capability HRD improvement system to support creative industry

If we look at Figure 1, the big bone has four main bones or four scientific fields. The scientific field of Vocational Education does not appear on that bone. But when we see the details of each main bone around the development of strategic issues, Vocational Education is just be parts of the

strategic issue in the two main bones, first is the main bone of Education Science and the other is in Mathematic, natural science, and technology.

The content development of strategic issue in Education Science; 1) Character of nation's education, 2) Teaching-based research, 3) Teacher profession, 4) **Vocational education**, and 5) Quality of institution. The content in Mathematic, Natural Science, and Technology; 1) Management of biological resources, 2) New and renewable energy, 3) Mathematic, natural science, and **Technology**, 4) Advance material and functional, 5) Climate change, Conversation, Quality of environment and control.

Based on this fact, showing that vocational education is only recognized as part of the science that is developed through research at YSU. That condition makes difficult to develop into its own scientific discipline according to the characteristics of vocational education. Especially if you see the area of research is very limited and do not cover the various aspects that should be the scope of the study in the vocational education.

Using the concept of developing strategic issue in the research field, especially in the context of vocational teacher education, we define six strategic issues tailored to the needs of vocational teachers' expertise and competence in the workplace. The sixth issue is: 1) Quality assurance, 2) Applied technology, 3) Evaluation, 4) Management, 5) Instructional (teaching and learning), 6) Curriculum. The main bone of Vocational Education and the details of six issues are presented in Figure 2.

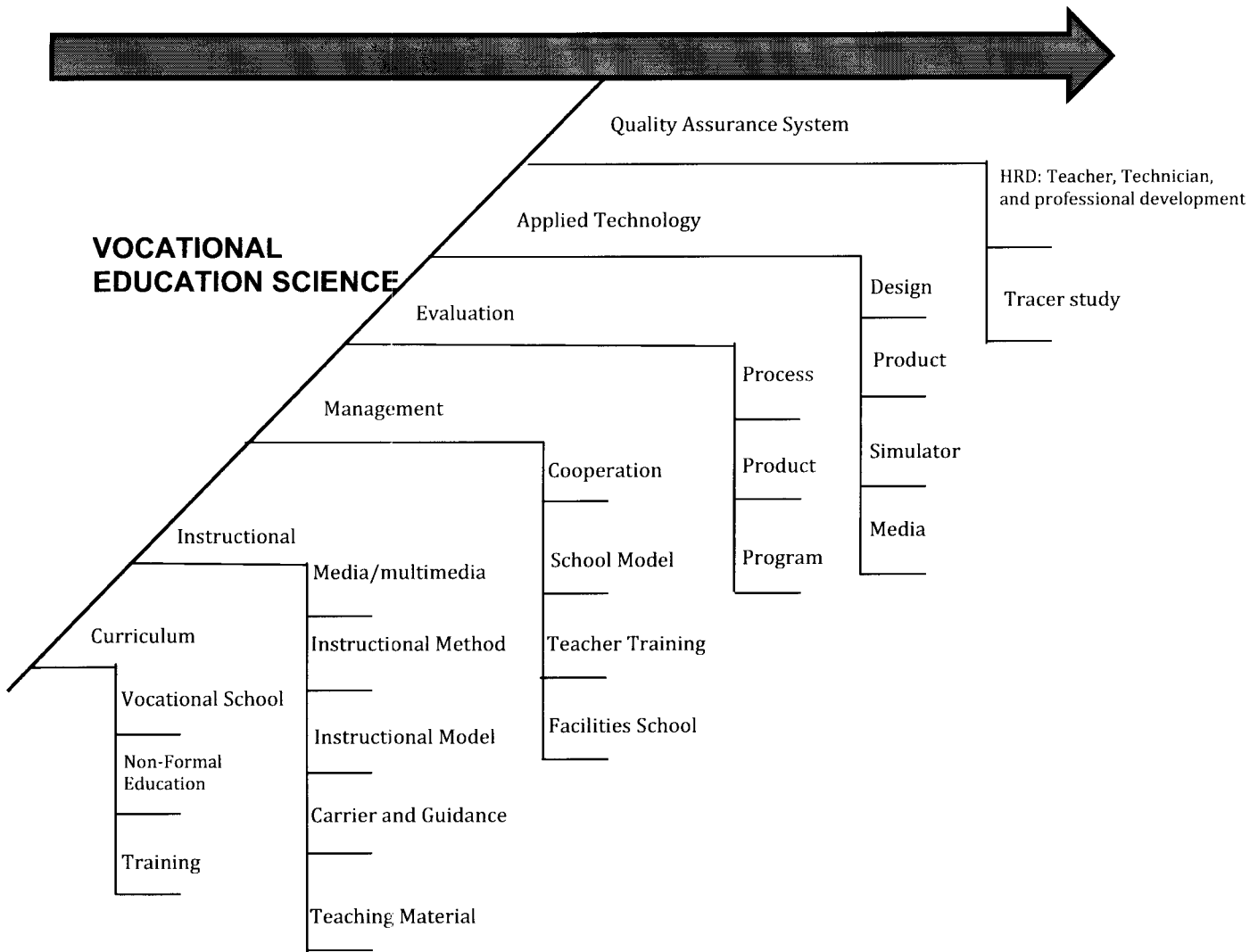


Figure 2: The main bone of Vocational Education

The content of each strategic issue is defined based on our experiences in the research field, especially in the context of vocational education. The aspect of professional development in VET (vocational Education Teacher) is placed in the development of strategic issue of Quality Assurance System. Through a good quality assurance system we will get more benefit in the implementation of vocational education. The aspect of technology in vocational education is implemented in the applied technology that is closer to the activity of how to use technology to solve the problem.

Furthermore, through a variety of assessment approaches and see the reality on the field work, then we make changes design to the YSU master plan of development especially in the figure of fishbone research road map see Figure 3.

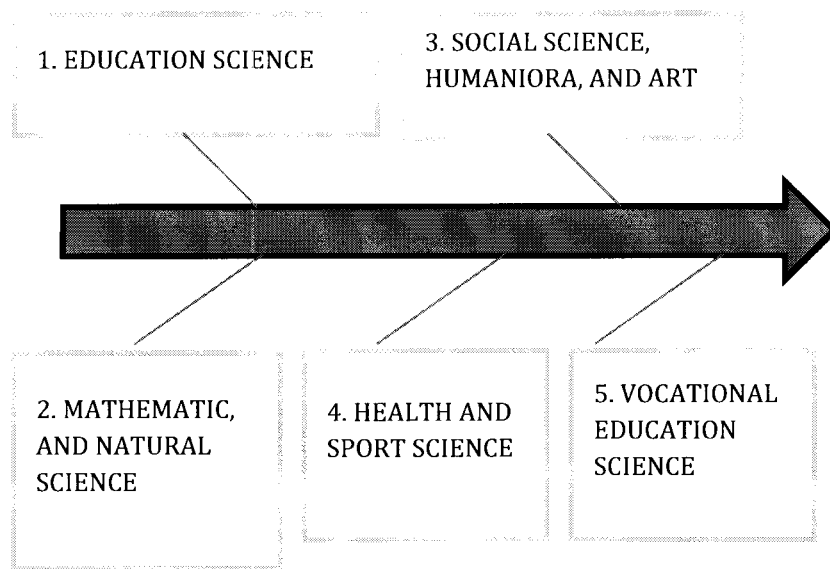


Figure 3: Draft YSU Master Plan of Development in Research

CONCLUSION

Preparing Vocational Education Teacher (VET), which requires scientific education and technology in one field science, can be done in the form of study program in university. Vocational education study program has been applied in the Engineering Faculty of YSU. The graduates from nine-program study have appropriate learning experiences vocational pedagogy depend on their vocational skill.

Development of scientific fields relevant to its application in the workplace can be realized through a review of instructional and research related to the science of specificity.

Differences in application and scientific needs between vocational education and general education indicate the need for vocational education into a self-reliant scientific field and academic discipline that separate from the field of education science and technology. The field of vocational education science commonly referred to as vocational pedagogy.

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Vocational Teacher Education and Research as a Task and Challenge for the East and Southeast Asian Region



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**Rajamangala
University
of Technology
Thanyaburi**



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The Conference Paper is made up of two sections.

- Section A: Conference Paper
 - Relevance of Vocational Teacher Education in Social, Economic and Political Terms
 - Regional Cooperation Platform for Vocational Teacher Education in Asia
 - Regional Areas of Development Mirrored in the International Discussion
 - Development of Standards for Vocational Teacher Education - Standards for Teacher Training in Technical and Vocational Education (TVET) Fields of Study (*Spöttl/ Becker*)
 - Regionalization and Pertinent Policies on Vocational Teacher Education- Instruments to connect VET Systems within the European Union (*Gramlinger*)
 - Enhancement of Praxis-Oriented in Vocational Education - Approaches towards Enhanced Praxis-orientation in Vocational Teacher Education (VTE) (*Lipsmeier*)
 - Enhancement of Vocational Education as an Independent Academic Discipline - Vocational Science as an Academic Discipline and its Research Approaches (*Schröder/ Schulte/ Spöttl*)
 - Conclusions and Recommendations
- Section B: Conference Programme and Speakers' Profiles

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Time	Program
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Parallel Workshops 9:00-12:00	<p>Workshop 3 Enhancement of Vocational Education as an independent academic discipline 901</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>chaired by</p>  <p>Ms Barbara TRZMIEL Programme Assis. TVET, UNESCO BKK, Thailand</p> </div> <div style="width: 45%;"> <p>chaired by</p>  <p>Prof Kazuhiro YOSHIDA Position Position</p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 30%;">  <p>Vocational Education Research in China</p> <p>Prof JIANG Dayuan ZIB, P.R. China</p> </div> <div style="width: 30%;">  <p>Interdisciplinary research of Economic Science and Vocational Education</p> <p>Prof Dr FENG Xiao Tongji, P.R. China</p> </div> <div style="width: 30%;">  <p>Introduction of Vocational Education as an academic study program at YSU</p> <p>Dr Mohammad Bruri TRIYONO YSU, Indonesia</p> </div> </div> <div style="margin-top: 10px;">  <p>Collaborative regional research as a basis for policy recommendations and educational reform in Asia and the Pacific</p> <p>Mr Gwang-Chol CHANG EPR, UNESCO BKK Thailand</p> </div>
	<p>Workshop 4 Enhancement of praxis-orientation in Vocational Teacher Education 202</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>chaired by:</p>  <p>Dr Li Jun Lecturer Tongji, P.R. China</p> </div> <div style="width: 45%;"> <p>chaired by:</p>  <p>Mithilan SUBRAMANIAM GIZ Young Professional UNESCO BKK, Thailand</p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 30%;">  <p>Approaches towards enhanced praxis-orientation in VTE</p> <p>Prof Dr Antonius LIPSMEIER KIT, Germany</p> </div> <div style="width: 30%;">  <p>Work-process analysis as a pre-condition for action-oriented VTE</p> <p>Dr Dadang KURNIA UPI, Indonesia</p> </div> <div style="width: 30%;">  <p>Cooperative regional development and implementation of new curriculum in VTE - experiences and reflections</p> <p>Prof Sy Ngia PHAN NUTE, Vietnam</p> </div> </div> <div style="margin-top: 10px;">  <p>Staff Capability Development @ Nanyang Polytechnic - A Holistic Approach</p> <p>Mr LAI Poh Hing NYP, Singapore</p> </div>
12:00-14:00	Lunch Sanhaowu
14:00-15:00	Presentation of Workshop Results 1-4 R 202
15:00-15:30	Final Podium Discussion R 202
16:00-17:00	Wrap up: Conclusions, Recommendations, Outlook R 202



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Introduction of vocational education as an academic study programme at

Abstract

The development of vocational education is growing more rapid and complex according to the technology needs in the work field. The institution of teacher vocational education and training that prepares candidates for teacher in vocational secondary school has a duty to support the student's experience learning in vocational skills and teaching skills. Both of those skills need a specific strategy for instruction that is different from the instruction used in preparing general teacher for general secondary school. The differences become more obvious when associated with the development technology and occupation in the work field. For this reason the enhancement role of vocational education scientific as an independent academic discipline in the implementation vocational education must be taken into consideration.

Based on Tanyaburi Statement, about "research on TVET have to be strengthened and/or established as a self-reliant scientific field and academic discipline", this article will discuss best practices of vocational instruction in workshop and research in vocational education that have been carried out in Yogyakarta State University, Indonesia. Yogyakarta State University has academic study programmes for preparing vocational teachers in secondary school. However, the university experienced some difficulties in how to deliver vocational education as an independent academic scientific discipline rather than being placed in the education and natural science domain.

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ZHENG Di

YAN Nannan

Shanghai Industrial Technical School

XU Lin

LING Cuixinang

Shanghai Information Management School

HU Ming

Shanghai Information Technology College

ZHANG Shizhong

Shanghai Institute of Information Technology

ZHANG Qin

Shanghai Jiaotong University - Health School Affiliated to Medical College

ZHANG Hong

SHEN Yuefen

Shanghai Modern Circulation School

ZHANG Wei

ZHOU Yunbin

Shanghai Municipal Educational Commission - Teaching Research office

GUAN Yuemei

ZHU Qingqing

Shanghai Senior Technical School

LIU Zhenghua

XU Jinbao

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